HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Eagle Creek National Fish Hatchery
Species or Hatchery Stock:	Winter Steelhead Trout
Agency/Operator:	United States Fish and Wildlife Service
Watershed and Region:	Clackamas River, Oregon Lower Willamette and Columbia rivers
Date Submitted:	
Date Last Updated:	Draft 12/09/2002

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Eagle Creek National Fish Hatchery

1.2) Species and population (or stock) under propagation, and ESA status.

Winter steelhead trout (*Oncorhynchus mykiss*), non-listed hatchery stock

1.3) Responsible organization and individuals

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

- U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office (CRFPO), technical support/hatchery assessment/production coordination
- U.S. Fish and Wildlife Service, Lower Columbia River Fish Health Center (LCRFHC), fish health technical assistance
- Oregon Department of Fish and Wildlife, fisheries management
- National Marine Fisheries Service (NOAA Fisheries), Mitchell Act funding and ESA

1.4) Funding source, staffing level, and annual hatchery program operational costs.

The funding source for the Eagle Creek National Fish Hatchery (NFH) is through Mitchell Act funding, administered by the National Marine Fisheries Service. The approved staffing matrix for the hatchery includes 7 permanent and 1 term employee; includes the project leader, assistant manager, program assistant, maintenance mechanic and four fish culturists.

The annual hatchery O&M cost for FY 2002 for the combined production of coho salmon and steelhead trout was $524,000, approximately $25,000 less than needed. The balance of funds in FY 2002 were supplied by the Yakama Nation which purchased fish food for the coho program.

1.5) Location(s) of hatchery and associated facilities.

Eagle Creek NFH is at Rkm 16 on Eagle Creek, in the Clackamas River watershed, Estacada, Oregon (46°16'34" N Lat. and 122°12'04" W Long. , pers. comm. Steve Vigg, NMFS).

1.6) Type of program.

Isolated Harvest (Lower Columbia River)

1.7) Purpose (Goal) of program.

Produce winter steelhead trout to help ***mitigate*** for fish losses in the Columbia River Basin caused by federal dams and provide opportunities for sport fisheries.

1.8) Justification for the program.

Legal Justification:

- Treaty of 1855
- Mitchell Act
- Fish and Wildlife Act
- Pacific Northwest Electric Power Planning and Conservation Act
- U.S. v Oregon court agreements

Eagle Creek NFH currently operates as part of the Columbia River Fisheries Development Program and is funded through the Mitchell Act - a program to provide for the conservation of Columbia River fishery resources, administered by NOAA Fisheries (NMFS). This program is a part of the mitigation for habitat loss resulting from flooding, siltation, and fluctuating water levels caused by Bonneville Dam. The Columbia River Fish Management Plan under U.S. v Oregon is currently under renegotiation, however, current production goals are generally consistent with the production goals in the expired plan.

1.9) List of program "Performance Standards".

See table in section 1.10.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

	Benefits	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
Program contributes to mitigation for construction of dams as defined in the Mitchell Act of 1937.	Achieve 0.33% smolt to adult survival back to the hatchery to collect 500 winter steelhead brood stock to produce 150K smolts for on-station release.	Monitor adult returns, smolt production, and survival rates and perform best rearing strategies to meet spawning and production goals.
Successfully maintain a brood stock of winter steelhead at Eagle Creek NFH without the need for out of basin egg or fish transfers to the hatchery.	Achieve a minimum 0.1% smolt-to-adult return back to the hatchery.	Smolt-to-adult survival rates are monitored for each brood-year release.
Assure that hatchery operations support production and harvest objectives.	Contribute to a meaningful harvest for sport fisheries from December through March of each year in the Willamette and Clackamas rivers and Eagle Creek. Achieve a 10-year average of 1% smolt-to-adult survival that includes harvest plus escapement.	Survival back to the hatchery will be estimated for each brood year released. Work with co-managers to establish meaningful fisheries and manage adult fish returning in excess of brood stock need.
Develop outreach to enhance public understanding, participation, and support of the U.S. Fish and Wildlife Service and Eagle Creek NFH programs.	Increase the visibility of the Fish and Wildlife Service facilities and to provide information about Service programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts include festivals, classroom participation, stream adoptions, and county fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program.
Implement measures for brood stock management to maintain integrity and genetic diversity of Eagle Creek hatchery stock.	A minimum of 500 adults are collected throughout the spawning run in proportion to age and sex composition at return.	Annual run timing, age and sex composition, and return data is collected and compared to historical data.
Communicate and coordinate effectively with co-managers in the Columbia River basin.	Participate in US v Oregon production advisory committee (PAC) and technical advisory committee (TAC) meetings. Discuss management issues for Eagle Creek NFH at an annual coordination meeting each spring between the Service and cooperators, including ODFW, NOAA Fisheries, Yakama Nation, Nez Perce Tribe, BLM, USFS, and PGE.	Develop technical reports for PAC and TAC. Hold hatchery evaluation team meetings each spring to review progress.
Design and implement projects to improve the quality of fish production at Eagle Creek NFH.	Projects are identified, reviewed, and implemented that will increase survival of program fish while minimizing impacts on wild populations.	Monitoring programs will be incorporated into project designs. Examples of projects include: diet studies, rearing and release studies, and rearing environment projects.

	Benefits	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
Release groups are sufficiently marked in manner consistent with information needs and protocols to determine impacts to natural and hatchery origin fish in fisheries.	On-station release: All winter steelhead released into Eagle Creek are adipose and right ventral (AdRV) fin clipped.	Returning fish are sampled throughout their return for length, sex, and mark recovery.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow USFWS Fish Health Policy and Implementation Guidelines and the Integrated Hatchery Operation Team (IHOT) Policy.	Necropsies of fish to assess health, nutritional status, and culture conditions.	Columbia River Fish Health Center (LCRFHC) inspect adult brood stock yearly and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, the LCRFHC recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary.
	Release and/or transfer exams.	Three to six weeks prior to transfer or release, 60 fish per lot are examined in accordance to the USFWS and co-managers policies.
	Inspection of adult brood stock.	At spawning, a minimum of 150 female and 60 male brood stock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery.	Control of specific fish pathogens through eggs/fish movements are conducted in accordance to the USFWS and co-managers policies. No fish or eggs from virus-positive brood stock are allowed into Eagle Creek NFH.
	Applied research on new and existing techniques.	Evaluate new and existing procedures for effects on health, disease control and prevention.

1.10.2) "Performance Indicators" addressing risks.

	Risks	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
Minimize impacts to ESA listed and other native species, their habitat, and the environment.	Hatchery operations comply with all state and federal regulations and Biological Opinions. Hatchery juveniles are raised to a release size goal of 5 to 6 fish/lb (b/w 180 to 250 mm) and released from the hatchery to expedite migration through Eagle Creek, Clackamas, Willamette, and Columbia rivers. Mass mark production fish with AdRV to identify them from naturally produced fish.	As identified in federal and state permits and Biological Opinions: Size at release, mass mark quality. Additional Service projects pending (straying, risk assessment, instream evaluations of juvenile and adult behavior, fish health).
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards, and protocols including IHOT, USFWS Fish Health Policy, state fish health requirements, and drug usage mandates from the Federal and Drug Administration.	Hatchery goal is to prevent the introduction, amplification, or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of Eagle Creek NFH.	Pathologists from the Lower Columbia River Fish Health Center will examine the fish once per month to ascertain health. Exams performed at each life stage include tests for virus, bacteria, parasites and/or pathological changes, as needed. Only Eagle Creek stocks are released into Eagle Creek. All stocks originating from off-station are transferred for release elsewhere to prevent vertically-transmitted disease introductions.
Effluent from artificial production facility will not detrimentally affect natural populations	Raceway cleaning effluent is sent to a pollution abatement pond where solids are removed prior to discharge.	Cleaning effluent and total discharge (normal operation) effluent are monitored weekly during high biomass quarters for suspended and settleable solids.
Water withdrawals and instream water diversion structures for artificial production facility operation will not affect spawning behavior of natural populations or impact juvenile rearing environment.	The primary water source, Eagle Creek, is not accessible to anadromous fish upstream of the hatchery because of a natural falls. Hatchery intake meets screening criteria.	All fish entering the hatchery are documented.
Hatchery operations comply with ESA responsibilities.	Hatchery conducts section 7 consultations and completes an HGMP. Federal and State permits are issued when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark (AdRV) juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvest is monitored by state and tribal agencies to meet biological opinion on fisheries.

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

500 proposed annual brood stock collection level, assuming equal numbers of males and females (maximum number of adult fish).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	On-station volitional release	150,000 April through May

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

See also discussion in Section 3.3.1 of this report.

Performance Standards for Winter Steelhead Trout at Eagle Creek National Fish Hatchery
M*odified from IHOT (1996):*

Measures	Hatchery Goal:	Average	Range	Comment
Adult Capture	500	805	251-3,671	1
On-Station Fish Releases	150K	176K	113K-207K	2
Egg Transfers	variable		500K	3
Fish Transfers	variable		90K	4
Percent Survival Smolt to Hatchery	0.33%	0.46%	0.08-1.2%	5
Smolt to Hatchery + Harvest	1%			6
Smolt Size for On-station Release (fish/lb)	5 to 6/lb.	5 to 6/lb.	3 to 8/lb.	7

Constraints/Comments—Eagle Creek National Fish Hatchery

1. Adult capture dependent on off-station survival rates, harvest rates, and stream flow in Eagle Creek during winter immigration. Data is from 1980-2002. CRiS\ReturnPr

2. On-station release data from calendar years 1990-2002. On-station release goal was recently reduced from 200K to 150K, in-part from improved survival rates and largely from reduced Mitchell Act funding. CRiS\DistBA2

3. Surplus eggs have been transferred to ODFW for Bonneville hatchery, research and STEP in some years.

4. In December of 1999, the draft HGMP identified production of 20,000 yearlings for transfer to ODFW net pens at Oregon City and production of 70,000 fry for transfer to ODFW for rearing at Clackamas hatchery.

5. Hatchery return data for brood years 1987 to 1999. CRiS\SMP\Cohort.prg 11/21/2002

6. Coded-wire tagging to assess survival and fisheries contribution was conducted for five years from brood years 1989 through 1993 but stopped because of the low rate of off station recoveries which underestimated survival and contribution (Pastor 1998 and Pastor 2000). Inadequate sampling programs were in-place to recover coded-wire tagged fish in the fishery. The 1% smolt to adult survival goal for harvest plus hatchery returns is based on 2.7 fish caught in the sport fishery for every fish returning to the hatchery (see Section 3.3 of this document for more information).

7. Release size goal from consultation with NMFS and ODFW.

1.13) Date program started (years in operation), or is expected to start:

1956

1.14) Expected duration of program.

On-going.

1.15) Watersheds targeted by program.

Eagle Creek is the watershed targeted by this program. Eagle Creek NFH is at Rkm 16 on Eagle Creek, (46°16'34" N Lat. and 122°12'04" W Long. , pers. comm. Steve Vigg, NMFS) which flows into Rkm 27 on the Clackamas River, which flows into Rkm 40 of the Willamette River, which flows into Rkm 163 of the Columbia River, HUC code 17090011, per the PIT tag database, PTAGIS, http://www.psmfc.org/pittag/Data_and_Reports/index.html

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

Main stem Columbia River and Snake River dam removal to restore habitat has been considered but currently regarded as an unrealistic alternative at this time. Refer to Federal Columbia River Power System (FCRPS) Biological Opinions on the subject (NMFS 2000 and USFWS 2000). Production decisions at Eagle Creek depend on Mitchell Act funding, tribal restoration funds, and co-manager decisions in the U.S. v Oregon forum, as well as State of Oregon Management Plans and ESA Biological Opinions.

The future direction of this program may change as regional decision makers address salmon and steelhead restoration needs. As changes occur in hydro, habitat and harvest and as hatchery reform is implemented, adaptive management strategies may include redirection of this program. As such changes occur, or where new information becomes available that may potentially affect listed salmon and steelhead species, the Service will reinitiate consultation by supplementing this HGMP.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1) List all ESA permits or authorizations in hand for the hatchery program.

- 1999 Biological Opinion on Hatchery Operations in the Columbia River.

- ESA Informal Consultation and EFH Consultation regarding the Eagle Creek fish barrier replacement project at the Eagle Creek National Fish Hatchery, Clackamas County, Oregon (tracking number I/NWR/2002/00771).

2.2) Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

2.2.1) Description of NMFS ESA-listed salmonid population(s) affected by the program.

- Identify the NMFS ESA-listed population(s) that will be directly affected by the program.

No NMFS ESA-listed populations will be directly affected by Eagle Creek National Fish Hatchery.

- Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.

Listed species occupying habitats in the lower Clackamas River and its tributaries, the lower Willamette River, and the lower Columbia River migration corridor(s) may be impacted by the presence of Eagle Creek NFH winter steelhead trout. NMFS ESA listed populations that may be incidentally affected are:

- Steelhead Trout *(Oncorhynchus mykiss),* Lower Columbia River ESU (Threatened Species, 63 FR 13347; March 19, 1998).

- Chinook Salmon *(Oncorhynchus tshawytscha)*, Lower Columbia and Upper Willamette River ESUs (Threatened Species, 64 FR 14308; March 24, 1999).

- Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)[a]

[a] Note: Although not Federally listed, the Oregon Fish and Wildlife Commission listed lower Columbia River wild coho salmon as an endangered species in July 1999. For the Clackamas River this constitutes the late-stock wild coho salmon produced primarily upstream of the North Fork Dam on the Clackamas River.

2.2.2) Status of NMFS ESA-listed salmonid population(s) affected by the program.[1]

[1] Information was extracted primarily from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service (USFWS 2002).

*Lower Columbia River Steelhead Trout ESU (*Threatened Species)

Status: Listed as a threatened species on March 19, 1998, this ESU includes all naturally spawned populations of steelhead (and their progeny) in streams and tributaries to the Columbia River between the Willamette and Hood Rivers, in Oregon (Myers et al. 1998). This would include Eagle Creek and its tributaries. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls. Both winter and summer steelhead are present in this ESU.

The Clackamas River is the principal spawning and rearing area for members of this ESU that pass through the Lower Willamette River and only late-run winter steelhead are included in the Clackamas River population (Busby et al. 1996). The steelhead trout populations in this ESU are of the coastal genetic group (Schreck et al. 1986, Reisenbichler et al. 1992) and a number of genetic studies indicate that they are part of a different ancestral lineage than inland steelhead from the Columbia River. Genetic Studies also show these populations to be distinct from those in the upper Willamette River and coastal streams in Oregon and Washington (61 FR 41541).

Critical Habitat: Critical habitat was designated February 16, 2000 (65 FR 7764); this designation was vacated by the District of Columbia District Court and remanded to NOAA Fisheries for new rulemaking pursuant to a court order in May, 2002.

Use of the Action Area: Adult winter steelhead migrate up the Clackamas River starting in November with low numbers being counted at the North Fork Dam (RM 31.0), on the Clackamas River from November through February. Greater numbers of native, winter-run steelhead occur at the North Fork Dam starting in March, with the peak of the adult migration occurring in April and May usually ending in June (ODFW 1992). The timing of adult Lower Columbia River winter-run steelhead on Eagle Creek and its tributaries is expected to be nearly the same as that documented on the Clackamas River. Adults from this ESU would be expected in Eagle Creek from November through mid-June, with a peak in March, April and May.

From April 12 through May 30, 2000 the hatchery staff operated a "V" trap in the lower ladder of Eagle Creek located downstream from the mouth of the North Fork of Eagle Creek. Sampling was completed by the USFWS to document the number of wild and hatchery steelhead passing the site and collect tissue samples (partial fin clip preserved in alcohol) for genetic analysis. A total of 88 unmarked wild and 17 marked hatchery fish were observed over the time period sampled. The unmarked wild fish plus three other groups were analyzed by Don Campton, USFWS Regional Geneticist. The other three groups examined were ODFW Clackamas hatchery F1 X wild crosses, Eagle Creek NFH, and ODFW Big Creek hatchery, with 60 samples taken from each group. Looking at data from 19 loci, all four groups were distinct from each other, with no two groups the same (information presented at hatchery coordination meeting, 02/22/01).

Within the Eagle Creek watershed, native winter-run steelhead spawn primarily in the North Fork of Eagle Creek, the lower 0.3 miles of Bear Creek, and in the lower two miles of Little Eagle Creek (USFS 1995). No spawning survey data was found pertaining to the main stem of Eagle Creek, however, suitable spawning habitat may be present in Delph Creek (a tributary of Eagle Creek) and main stem Eagle Creek downstream of the hatchery. Native winter-run steelhead begin spawning in April with peak spawning occurring in May. Spawning is completed by mid-June (ODFW 1992).

In the Clackamas River subbasin, juvenile winter steelhead fry emerge primarily in May and June and rear in freshwater from one to three years before out-migrating to the estuary or ocean in the spring of their second or third year (ODFW 1992). Screw trap data collected on Fish Creek in the upper Clackamas River basin indicate that a percentage of juvenile steelhead parr rear during the summertime in the main stem Clackamas River or in the reservoir complex. Others remain in their natal tributary (Everest et al. 1986). On Fish Creek, underyearling (age 0+) steelhead trout were found to make use of riffles, pools, side-channels and alcoves. Age 1+ steelhead trout were found to rear in these same habitat types as well as in beaver ponds. The availability and quality of quiet stream margins in late spring and early summer was found to be a key habitat need for post-emergent steelhead fry (Everest et al. 1986).

The timing and number of juvenile steelhead (fry and parr) as well as smolts moving downstream from North Fork Eagle Creek is monitored by the Pacific Northwest Research Station (PNW) via five-foot rotary screw traps (Strobel and Hansen 2001; Lumianski 2000). North Fork Eagle Creek enters Eagle Creek downstream of the hatchery and supports wild runs of native winter steelhead (USFS 1995). In 2000, it was estimated that a total of 5,822 steelhead juvenile migrants (fry and parr) left North Fork Eagle Creek compared to 8,162 in 1999. Peak capture date for juvenile steelhead was May 31 and May 6 in 1999 and 2000, respectively (Strobel and Hansen 2001; Lumianski 2000). The mean length of steelhead parr and fry was 99.6 mm and 100.6 mm in 1999 and 2000, respectively. An unknown percentage of these migrating juveniles would be expected to rear in the main stem Eagle Creek throughout the summer.

Juvenile steelhead smolt in the spring and emigrate downstream in March through June (ODFW 1992). In 2000, screw traps were operated on the North Fork Eagle Creek from March 17 through June 14. The 2000 steelhead smolt population estimate for North Fork Eagle Creek was 2,248, about 40 percent below the 1999 estimate (3,750) and approximately 10 percent below the mean for all estimates since 1998 (Strobel and Hansen 2001). In 2000, outmigrating smolts were collected from March 17 through June 8, with the greatest number of outmigrating steelhead smolts being captured between March 31 and May 11. In 2000, the peak capture date occurred on April 9 (Strobel and Hansen 2001), while in 1999 the peak capture date was May 24 (Lumianski 2000). The mean length of outmigrating steelhead smolts was 157.6 mm and 155.7 mm fork length (FL) in 1999 and 2000, respectively. Steelhead smolts from this ESU are predominately 2+ years of age and typically move rapidly downstream to the ocean (Busby et al. 1996).

Lower Columbia River Chinook Salmon ESU (Threatened Species)

Status: The lower Columbia River Chinook salmon ESU was listed threatened on March 24, 1999. According to NMFS (63 FR 14307), production in this ESU appears to be predominantly hatchery-driven with few identifiable naturally spawned populations. The apparently healthy population in the Lewis River is the single exception. Long- and short-term trends in abundance of individual populations are mostly negative, some severely so. About half the populations comprising this ESU are very small. In the Williamette River Basin, a single small population of fall chinook that spawns in the lower main stem Clackamas River represents the Lower Columbia River Chinook ESU.

Both fall-run and spring-run stocks of chinook salmon are included in this ESU. The fall run is predominant. The majority of the fall run chinook salmon are called "tules" and are distinguished by their dark skin coloration and advanced state of maturation at the time of freshwater entry. The lower Clackamas River population consists of these early run "tules" and is thought to originate from hatchery stock first released into the Clackamas subbasin in 1952 (ODFW 1992).

Critical Habitat: Critical habitat was designated February 16, 2000 (65 FR 7764); this designation was vacated by the District of Columbia District Court and remanded to NOAA Fisheries for new rulemaking pursuant to a court order in May, 2002.

Use of the Action Area: Fall chinook salmon are not known to use Eagle Creek due to passage constraints created by low water conditions at the mouth and lower falls during adult migration periods (Dysart pers. comm. 2002). Specific information on adult run timing for native fall chinook in the Clackamas River subbasin was not available but is thought to be similar to passage timing of adults at Willamette Falls. In 1999, adult fall Chinook passed over Willamette Falls from mid-August through late September with peak passage from early to mid-September (Foster 2001).

Native fall chinook are thought to spawn in the lower main stem Clackamas River (below River Mill Dam and in the lower reaches of Clear Creek, a tributary to the Clackamas River; ODFW 1992). On the Clackamas River, fall chinook spawn from mid-September through early October (Foster 2001). The estimated fall chinook run to the Clackamas River subbasin averaged 840 fish annually from 1981 to 1991 (ODFW 1992).

Juvenile fall chinook salmon generally emigrate to the ocean as subyearling fish (age 0+). Subyearling fall chinook may outmigrate almost immediately as fry (<50 mm FL), while others may rear for 60 to 150 days before beginning emigrating to the ocean as fingerlings (50-120 mm FL) in the late summer or early fall (Healy 1991). It is assumed that juvenile chinook salmon from this ESU may be present in the Clackamas River subbasin after emerging from the gravel in winter until outmigrating in March through June.

Upper Willamette River Chinook Salmon ESU (Threatened Species)

Status: The upper Willamette River spring chinook salmon was listed as a threatened species on March 24, 1999 (NMFS 2002). This ESU includes all naturally spawned populations of spring-run chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls. Historically, five major basins produced upper Willamette spring chinook including the Clackamas, North Santiam, South Santiam, McKenzie and Middle Fork Willamette (ODFW 2001). Today, it is estimated that the McKenzie River accounts for about half of the natural production of spring chinook in the entire Willamette River basin and the Clackamas River accounts for about 20 percent of the natural production (ODFW 2001).

ODFW (2001) has defined a critical threshold of 300 spawners per year for the Clackamas spring chinook population. The interim Willamette Basin Plan escapement goal for the Clackamas subbasin plan is 2,900. Currently, the Clackamas wild population of spring chinook salmon appears to exceed critical and interim thresholds for abundance and productivity during recent years.

In 1999, ODFW (Foster 2001) estimated that 8,300 spring chinook entering the Willamette River were bound for the Clackamas River. Counts at the North Fork Dam (RM 31.0) provide an index of spawning escapement. In 1999, of the 8,300 spring chinook entering the Clackamas River, 988 were thought to be natural spawners, 888 of which were counted at the North Fork Dam. This was the lowest natural escapement above North Fork Dam since 1979. The ten-year (1989-99) average adult spring chinook escapement above North Fork Dam is 2,500 fish. In 2000, however, 2,277 adult spring chinook passed over the North Fork Dam. Spring chinook are also produced at the Clackamas Hatchery (RM 23) located on Dog Creek in McIver Park. Hatchery and wild fish cannot be distinguished until 2002 when all returning hatchery fish will be marked (ODFW 2001).

Critical Habitat: Critical habitat was designated February 16, 2000 (65 FR 7764); this designation was vacated by the District of Columbia District Court and remanded to NOAA Fisheries for new rulemaking pursuant to a court order in May, 2002.

Use of the Action Area: Adults of this ESU generally enter freshwater in spring, several months prior to spawning in the fall, and are usually associated with early timed runs of fish (Myers et al. 1998). Most upper Willamette River spring chinook adults return at age four and five with a small percentage returning in their third or sixth years (Foster 2001). The larger age-five fish enter the Willamette River earlier than do the smaller age-four fish.

The return of adult upper Willamette River spring chinook salmon to the Clackamas River is monitored by Portland General Electric (PGE) at the North Fork Dam. Adults start moving over the dam in May and June with the peak occurring in July, August and

September. The run continues through October with generally only a few adults ascending the dam in November (ODFW 1992; Taylor 1999). Because these fish hold downstream of North Fork Dam, run timing as observed at the dam may be delayed in comparison to Eagle Creek. Adult spring chinook returning to spawn in Eagle Creek or its tributaries would be expected to hold in Eagle Creek starting in May until fall when they spawn in late August through October.

Intensive spawning surveys were conducted by ODFW (King et al. 2000) in the Clackamas River basin from 1996 through 1998 to document the timing, distribution and abundance of natural spawning. These surveys found that an average of 85 percent of the spring chinook redds were deposited in the main stem Clackamas River above the North Fork Dam, with about 15 percent being deposited in tributaries above the dam. Spring Chinook also spawn downstream of the North Fork Dam on the Clackamas River but at much lower numbers. Surveys in 1998 estimated that the lower Clackamas River below River Mill Dam accounted for 11% of the total redds deposited (King et al. 2000); Eagle Creek was not surveyed. On the upper Clackamas River, spring chinook salmon generally begin spawning in late August, with peak spawning activity occurring in September and October (Taylor 1999). Spawning historically occurred in Eagle Creek (King et al. 2000) and would also be expected to start in August and continue through October.

The upper Willamette River spring-run chinook salmon (including the Clackamas River spring chinook) remain one of the most genetically distinctive populations of chinook salmon in the Columbia Basin and have characteristics of both stream and ocean-type chinook salmon. Smolt emigration occurs in fall as young-of-the-year and in spring as age-1 fish (NMFS 2000). Juvenile spring chinook salmon (age 0+) would be expected to rear in Eagle Creek throughout the year. An unknown percentage of juveniles (age 0+) may move downstream to the Clackamas River during the summertime and then back upstream into their natal tributary to over winter (Everest et al. 1986). Some fall migrants (age 1+) may continue to rear in the lower Clackamas and Willamette Rivers until the following spring before emigrating to the ocean.

In 1999, a total of 113 salmonid fry (< 50 mm FL) were collected from mid-March to mid-June at the North Fork Eagle Creek screw trap and only one of these was identified as being a juvenile chinook salmon (Lumianski 2000). In 2000, a total of 275 salmonid fry were collected from the North Fork Eagle Creek by screw trap. None of these were identified as being juvenile chinook salmon in the report (Strobel and Hansen 2001).

The number of spring chinook smolts out-migrating from the Clackamas River has been monitored since 1959 by PGE at their North Fork Dam fish facility (King et al. 2000). In 1999, a total of 4,305 juveniles passed over the North Fork Dam, compared to the 10-year (1989-98) average of 13,600. Peak downstream movement of naturally produced juveniles past the North Fork Dam is in May. In 1999, 2,336 wild spring chinook juveniles (54 percent) passed over the dam in May. A second out-migration of the wild smolts occurs in October and November (ODFW 1992). Outmigration timing for juvenile

spring Chinook smolts on Eagle Creek is expected to follow the same pattern as found on the Clackamas River.

Lower Columbia River/Southwest Washington Coho Salmon (Candidate Species) [1]

Status: This ESU includes naturally-spawning coho from all tributaries of the Lower Columbia River up to the Deschutes River on the Oregon side, including the Willamette River up the Willamette Falls (NMFS 2002). This ESU was previously reviewed by NMFS for possible listing as a threatened species but was determined not to warrant listing because of apparent widespread dilution of the native populations with hatchery fish. The NMFS is presently reviewing new information on the status of coho in this ESU and will be making a determination of whether to go forward with another proposal to list in the near future.

Wild coho salmon that migrate through the Lower Willamette River spawn in the Clackamas River and are included in this ESU. Coho salmon that spawn in the Clackamas River consist of an early-run spawning component and late-run spawning component (Cramer and Cramer 1994). ODFW considers the late run component to be a native population. The native coho population of the Clackamas River is thought to be the last remaining viable wild coho population in the Columbia Basin (Cramer and Cramer 1994). Genetic evidence suggests that native, late-run coho component in the Clackamas River is unique from the native coho of the Sandy River and other Columbia River tributaries. The early-run coho population is thought to be remnant of liberated hatchery fish that persist as naturally-spawning, self-sustaining population. The Clackamas River late-run coho population is considered depressed, vulnerable to over-harvest, and in danger of extinction in the foreseeable future (Weitkamp et al. 1995).

Use of the Action Area: Adult, late-run, native coho salmon migrating through the lower Willamette River are returning primarily to the Clackamas River to spawn. Most of the production of late-run wild coho is thought to occur above North Fork Dam on the Clackamas River (ODFW 1992). The ten-year average late run of coho to the Clackamas River numbered 759 fish from November 1989 through March 1998 (StreamNet 2002). This number dropped to a record low in the 1996-1997 migration when only two (2) late-run fish were recorded at the North Fork Dam (Strobel and Hansen 2001). The native, late-run coho salmon start passing over the North Fork Dam (RM 31.0) in October and November, with peak numbers migrating past the dam in December, January, and February. Spawning occurs from late-January through mid-March with a peak in mid to late February (Cramer and Cramer 1994).

The use of Eagle Creek by native, late-run coho is not well documented. Adult migration timing on Eagle Creek would be expected to follow the same pattern as found on the Clackamas River at the North Fork dam. Coho smolts and fry are collected at the North

[1] Although not Federally listed, the Oregon Fish and Wildlife Commission listed lower Columbia River wild coho salmon as an endangered species in July 1999. For the Clackamas River this constitutes the late-stock wild coho salmon produced primarily upstream of the North Fork Dam on the Clackamas River.

Fork Eagle Creek screw trap from March through June indicating that spawning occurs in the North Fork Eagle Creek (Lumianski 2000, Strobel and Hansen 2001). It is not known if the coho spawning there are native or hatchery strays. Hatchery coho are produced at the Eagle Creek NFH and hatchery adults may spawn naturally below the hatchery. Spawning by native coho or by coho of hatchery origin may also occur in the main stem Eagle Creek below the hatchery and in Delph Creek.

The majority of coho salmon mature in their third year of life, having spent about four to six months in incubation and up to fifteen months rearing in freshwater, followed by a sixteen-month growing period at sea (Sandercock 1991). These fish are designated 1.1 (i.e., one winter in freshwater and one winter in salt water), based on scale patterns. There are many variations to this pattern as some juveniles may rear in freshwater for two winters and return as age 2.1 fish (Sandercock 1991). Juvenile coho are known to rear throughout the summer in the upper Clackamas River basin preferring beaver ponds, glides and side channels and quiet edge habitats where woody debris and cover is prevalent (Everest et al. 1986). Juvenile coho would be expected to be present in Eagle Creek throughout the summer.

Juvenile coho are counted migrating downstream though the North Fork Clackamas River migrant bypass system in every month of the year. Generally, outmigrants captured at the North Fork trap from April through June have a silvery smolt-like appearance, but most juveniles migrating December through March and July through October appear to be parr. The outmigration of coho juveniles for the Clackamas River generally begins in April, peaks in May and June and is essentially over by early July. Historically, a second outmigration of smolts occurred in the fall, primarily during November (Cramer and Cramer 1994).

The outmigration timing of coho juveniles on Eagle Creek would be expected to generally follow the same pattern as that found in the Clackamas River. On the North Fork Eagle Creek, coho juveniles (fry, parr and smolts) have been collected by screw trap since 1997 (Lumianski 2000, Strobel and Hansen 2001). The peak capture date for coho juveniles (fry and parr) was March 14 and June 1 in 1999 and 2000, respectively. The mean length of these juveniles was 71.9 mm and 60.0 mm FL in 1999 and 2000, respectively.

In 2000, North Fork Eagle Creek produced an estimated 598 coho smolts, down from the 1999 estimate of 3,246 smolts (Strobel and Hansen 2001). Coho smolts were collected during all weeks between March 17 and June 8, 2000, with the majority of smolts being collected between April 14 and May 25, 2000. The peak capture date for coho smolts was May 11 and 12 in 2000 and May 19 in 1999. Mean fork length for emigrating coho smolts was 111.4 mm and 112.5 mm FL in 1999 and 2000, respectively (Lumianski 2000, Strobel and Hansen 2001).

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target

area, and provide estimated annual levels of take *(see "Attachment 1" for definition of "take")***.**

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

The primary NMFS listed species potentially affected by hatchery operations is the late Clackamas winter steelhead. This species is found in Eagle Creek, usually in the main stem below the middle falls and in the North Fork of Eagle Creek. It is feasible for the fish to ascend Eagle Creek to the hatchery, but no adult fish have been collected at the hatchery during the spawning of hatchery winter steelhead or seen in the proximity of the hatchery in the spring. In 1990, 1991, and 1992 a handful of steelhead were recorded entering the hatchery in September, October, and November. Based on appearance of the fish, they were recorded as summer steelhead (Doug Dysart, personal communication).

Adverse hatchery effects on listed steelhead would primarily be caused by the operation of the electric weir at the entrance to the adult collection pond. However, the weir is not operational from the third week of March until the middle of September making the weir a passable, non-lethal barrier during the period of time that late winter adults may be found in the area.

No take of listed steelhead is anticipated. If a take for this species occurs, trapping operations for early winter steelhead will be reduced to compensate for the arrival of late winter steelhead.

No take of listed Chinook salmon is anticipated. Spring Chinook salmon were produced and released from Eagle Creek NFH from the start of production in 1958 through brood year 1991. Since stopping the program, a handful of spring Chinook adults are still observed or recovered at the hatchery rack (King et al. 2000 – Table 4). Since brood year 1996, ODFW has mass marked all hatchery raised spring Chinook in the Willamette watershed, including Clackamas hatchery, with either an adipose fin clip, adipose fin clip plus coded-wire tag, or code-wire tag only (ODFW 2001). In the unusual event that unmarked "listed" Chinook enter the hatchery, the fish will be placed in a temporary holding pond and NMFS (Rich Turner, 503-736-4737 phone) and ODFW (Jim Muck, 503-657-2000 phone) will be contacted for further directions.

The primary State of Oregon listed species potentially affected by hatchery operations is late Clackamas coho salmon (not federally listed). Take of State of Oregon listed late-stock coho salmon is possible, but minimal, during brood stock operations for hatchery coho salmon and winter steelhead.

Returning early-run hatchery winter steelhead are collected for brood stock at the hatchery rack in Eagle Creek, December through mid-March. While hatchery brood

stock collection for early run winter steelhead coincides with late returning coho salmon, documentation of later returning coho salmon at the hatchery is rare.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

No known take of NMFS-ESA listed fish occurred during operation of Eagle Creek NFH winter steelhead production.

The documentation is not clear on whether the fish were "wild" late returning coho, but records from 1993 indicate that 15 males and 13 females returned on December 13, 1993 with an additional 16 males returning on December 22, 1993. Because late run wild coho are currently listed under the State of Oregon's Endangered Species Act, the disposition of any late run coho which now return to Eagle Creek NFH will be determined by contacting the ODFW District Biologist, Jim Muck, (503) 657-2000, phone.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).
*Complete the appended "take table" (**Table 1**) for this purpose. Provide a range of potential take numbers to account for alternate or "worst case" scenarios.*

No known take of NMFS-ESA listed fish will occur during operation of Eagle Creek NFH winter steelhead production. In the unusual event that a late run, NMFS listed winter steelhead enters the hatchery, the Service has shown one listed steelhead as potential take (Table 1 Take Table).

In the unusual event that a State of Oregon listed coho salmon enters the hatchery, the Service has shown one state listed coho as potential take (Table 1 Take Table).

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

No take of NMFS-ESA listed fish is expected during operation of Eagle Creek NFH winter steelhead production. However, in the unusual event that unmarked "listed" steelhead enter the hatchery, the fish will be placed in a temporary holding pond and NMFS (Rich Turner, 503-736-4737 phone) and ODFW (Jim Muck, 503-657-2000 phone) will be contacted for further directions.

Because late run wild coho are listed under the State of Oregon's Endangered Species Act, the disposition of any late run coho which return to Eagle Creek NFH will be determined after contacting the ODFW District Biologist (Jim Muck, 503-657-2000 phone).

Furthermore, as part of our regular sampling program, fish killed for brood stock or surplus to production will be sampled for species identification, marks, age, sex, and tag recovery. Scales from fish that are unmarked will be examined to determine if they are hatchery or naturally produced.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

Production of winter steelhead from Eagle Creek National Fish Hatchery is consistent with:

- 1999 Biological Opinion on Columbia River hatcheries (NMFS 1999).
- 2000 Biological Opinions on the Federal Columbia River Power System (NMFS 2000 and USFWS 2000).
- 1999 NPPC Artificial Production Review (NPPC 1999).
- Clackamas River Subbasin Fish Management Plan (ODFW 1992).

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Eagle Creek NFH was authorized under the Mitchell Act and operates under the auspices of the Columbia River Fish Management Plan (CRFMP) of *U.S. v Oregon.* Even though the CRFMP has officially expired, production programs at many Columbia Basin facilities, including Eagle Creek NFH, are still guided by the production section of the former plan. The CRFMP is currently being renegotiated. Eagle Creek NFH operates in compliance of the ESA, 1999 hatchery Biological Opinion (NMFS 1999a).

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

All on-station releases of winter steelhead are mass marked (adipose and right ventral fin clipped) for the purpose of selective fisheries and brood stock management. Brood years 1989 through 1993 were also coded-wire tagged but few fishery recoveries were observed (Pastor 1998 and Pastor 2000). Most coded-wire tagged fish were recovered at

the hatchery, a very low percent were reported in freshwater sport fisheries, and none were recovered in ocean fisheries. Low sampling effort, particularly in freshwater fisheries, accounts for the low fishery tag recovery. However, Eagle Creek NFH winter steelhead do contribute to sport fisheries in the lower Willamette and Clackamas rivers and Eagle Creek (Keeley 1995). From reviewing hatchery escapement records and catch information provided in ODFW (1992) and Keeley (1995), we have estimated catch per escapement statistics. On average 1.86 fish are caught in Eagle Creek for each fish returning to the hatchery (65% catch in Eagle Cr / 35% hatchery escapement). An average 2.7 fish are caught in the entire Clackamas subbasin for each fish returning to the hatchery (73% catch in Clackamas & lower Willamette fisheries / 27% hatchery escapement). Based on these statistics winter steelhead production from Eagle Creek can provide a substantial sport fishery.

From a Columbia River wide perspective, the 1999 fall season harvest biological opinion determined that fisheries managed to stay within the Snake River wild fall Chinook and wild Group B steelhead jeopardy standards. Furthermore, this fishery would not jeopardize any of the other listed species (NMFS 1999b).

3.4) Relationship to habitat protection and recovery strategies.

As previously stated in Section 1.7, the purpose of the winter steelhead program at Eagle Creek NFH is to help mitigate for fish losses in the Columbia River Basin caused by federal dams and to provide opportunities for sport fisheries.

Habitat management and protection strategies in the Clackamas watershed are described in ODFW (1992). Habitat degradation has occurred from past forestry practices, roads, urban development, hydroelectric facilities, water rights over-appropriation, and poor ocean conditions. Refer to Federal Columbia River Power System (FCRPS) Biological Opinions (NMFS 2000 and USFWS 2000) and the Willamette Subbasin Summary (Bastasch et al. 2002) for further discussion on the subject.

3.5) Ecological interactions. [Please review Addendum A on additional information for USFWS jurisdictional species.]

Salmonid and non-salmonid fishes or other species that could:

1) negatively impact program;

A variety of freshwater and marine predators such as northern pikeminnows, Caspian terns, and pinnipeds, can significantly reduce overall survival rates of program fish. Predation by northern pikeminnow poses a high risk of significant negative impacts on the productivity of hatchery fish (SWIG 1984). Based on PIT tags recovered at a large Caspian tern nesting colony on Rice Island, a dredge material disposal island in the

Columbia river estuary, 6-25 million of the estimated 100 million out-migrating juvenile salmonids reaching the estuary were consumed by the terns in 1997 (Roby, et al. 1997). The Fish Passage Center (Berggren 1999) estimates, from about 57,000 PIT tag recoveries from Rice Island, that through 1991, about 0.2% of all PIT tagged fish released into the Columbia River showed up on Rice Island. That percentage had increased by a factor of ten by the 1997 and 1998 juvenile salmonid out-migrations, with hatchery and wild steelhead having been the most effected by the increased predation. A NMFS Working Group (NMFS 1997) determined that California sea lion and Pacific harbor seal populations in the three west coast states have risen by 5-7% annually since the mid-1970s. Their predation on salmonids may now constitute an additional factor on salmonid population declines and can effect recovery of depressed populations in some situations.

In 2001, whirling disease was detected in the rainbow trout kept on river water at a private hatchery on Clear Creek in the lower Clackamas River Basin. Pathologists of Oregon Department of Fish and Wildlife determined that this most likely originated from straying adult steelhead that had shortcut their return journey to the Grande Ronde/Snake River Basins where the causative parasite is endemic. It is possible that this parasite could be introduced further upriver to Eagle Creek if carried by infected stray steelhead or other animals, such as birds.

2) be negatively impacted by program;

Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run chinook salmon ESU (threatened); Snake River spring/summer-run chinook salmon ESU (threatened); Lower Columbia River chinook salmon ESU (threatened); Upper Willamette River chinook salmon ESU (threatened); Upper Columbia River spring-run chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Upper Willamette River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). An additional concern is the Southwestern Washington/Columbia River coastal cutthroat trout, pacific lamprey, and State of Oregon listed coho. See the ecological interactions discussion below.

3) positively impact program;

Returning chinook and other salmonid species that naturally spawn in the target stream and surrounding production areas may positively impact program fish. Decaying carcasses may contribute nutrients that increase productivity of the overall system.

4) be positively impacted by program;

A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Reductions and extinctions of wild populations of salmon could reduce overall ecosystem productivity. Because of this, hatchery production has the potential for playing an important role in population dynamics of predator-prey relationships and community ecology. The Service speculates that these relationships may be particularly important (as either ecological risks or benefits) in years of low productivity and shifting climactic cycles.

In addition, wild co-occurring salmonid populations might be benefited as schools of hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. See the ecological interactions discussion below.

Ecological Effects of Winter Steelhead Hatchery Production:

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Winter Steelhead: Rear 150,000 fish to a yearling smolt size of 5 to 6 fish/pound and volitional release directly into Eagle Creek from April to May. There are no fry released directly from this station into Eagle Creek.

The 1999 Biological Assessment for the Operation of Hatcheries funded by the National Marine Fisheries Service under the Columbia River Fisheries Development Program (NMFS 1999c) and the 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999a) present a discussion of the potential effects of hatchery programs on listed salmon and steelhead populations. The reader is referred to the discussion in those documents.

Nine generalized types of effects that artificial propagation programs can have on listed salmon and steelhead populations were identified. These effects include: 1. Hatchery operation, 2. Brood stock collection, 3. Genetic introgression, 4. Hatchery production (density-dependent), 5. Disease, 6. Competition, 7. Predation, 8. Residualism, and 9. Migration corridor/ocean. Potential effects in these categories may apply to all hatchery programs to one degree or another depending on the particular program design.

A discussion of ecological interactions relative to the Eagle Creek NFH program follows:

1. Hatchery operation- Eagle Creek is the water source for the Eagle Creek NFH. Water withdrawals for hatchery operation are not expected to have a significant negative impact on natural spawning populations. Hatchery effluents meet established NPDEP release standards criteria and are diluted by the flow in Eagle Creek reducing potential negative impacts to natural stocks. An impassable barrier (falls) just above the hatchery site precludes access to the watershed above the hatchery for anadromous species use.

2. Brood stock collection- Returning winter steelhead are collected for brood stock at the hatchery rack in Eagle Creek, December to mid-March. Stray steelhead from other locations are not known to occur at Eagle Creek NFH. Steelhead hatchery production from Eagle Creek NFH are uniquely marked and only those marked fish from the hatchery are used for brood stock. In the unusual event that unmarked "listed" steelhead enter the hatchery, the fish will be placed in a temporary holding pond and NMFS (Rich Turner, 503-736-4737 phone) and ODFW (Jim Muck, 503-657-2000 phone) will be contacted for further directions.

Documentation of later returning coho salmon at the hatchery is rare, however, records from 1993 indicate that 15 males and 13 females returned on December 13, 1993 with an additional 16 males returning on December 22, 1993. Because late run wild coho are currently listed under the State of Oregon's Endangered Species Act, the disposition of any late run coho which now return to Eagle Creek NFH will be determined by the ODFW District Biologist, Jim Muck, (503)657-2000, phone.

Spring Chinook salmon were produced and released from Eagle Creek NFH from the start of production in 1958 through brood year 1991. Since stopping the program, a handful of spring Chinook adults are still observed or recovered at the hatchery rack (King et al. 2000 – Table 4). Since brood year 1996, ODFW has mass marked all hatchery raised spring Chinook in the Clackamas watershed with either an adipose fin clip, adipose fin clip plus coded-wire tag, or code-wire tag only (ODFW 2001). In the unusual event that unmarked "listed" Chinook enter the hatchery, the fish will be placed in a temporary holding pond and NMFS (Rich Turner, 503-736-4737 phone) and ODFW (Jim Muck, 503-657-2000 phone) will be contacted for further directions.

All fish that enter the hatchery are identified to species and enumerated, with recognizable marks and final disposition noted. All wild fish will be returned to Eagle

Creek when possible. The data is recorded into the USFWS Columbia River information System's fish removal file as our permanent record.

3. Genetic introgression- Eagle Creek hatchery winter steelhead are not known to contribute to a significant straying problem outside of the local area but may spawn naturally in the lower Eagle Creek drainage. Where the North Fork of Eagle Creek supports a run of wild, late-run winter steelhead, most wild, late winter steelhead populations are found in the upper Clackamas watershed (see Section 2.2.2). Adults from this ESU would be expected in Eagle Creek from November through mid-June, with a peak in March, April and May. Hatchery winter steelhead are collected for brood stock at the hatchery rack in Eagle Creek, December to mid-March. There is some overlap in potential run and spawn timing, but most wild, listed fish have a later run and spawn timing than the hatchery stock at Eagle Creek NFH. This temporal separation reduces genetic introgression. Sampling such as trapping, genetic ID, underwater video, and radio telemetry at the lower ladder in Eagle Creek would provide additional information on the potential for genetic introgression of hatchery fish in the stream.

4. Hatchery production (density dependent effects)- Eagle Creek NFH on-station releases are moderate in magnitude (around 150,000 winter steelhead trout) relative to other Columbia River production programs. This level of release is not expected to cause serious density dependent effects in the Clackamas or lower Columbia rivers. All hatchery production released on-station are marked to promote selective harvest while providing protection for wild stocks. Eagle Creek NFH production is typically released in April and May under a volitional release strategy. Volitionally released fish, with a propensity to migrate, should reduce potential migration corridor effects as the fish migrate quickly out of the system. Potential effects are discussed in more detail in the subsequent sections on disease, competition, predation, residualism, and migration corridor/ocean.

5. Disease- The steelhead are remarkably healthy with only two findings of virus in over 30 years and a very low incidence of the reportable bacterial pathogens that plague other hatcheries (Fish Health Inspection Reports, 1970 to present, Lower Columbia River Fish Health Center). Adults return with no virus and low levels of two bacterial pathogens so there is little or no vertical transmission of disease to their offspring. Juvenile fish are rarely affected by more than dorsal fin erosion. Because Eagle Creek juveniles are downstream of the major dams en route to the ocean, there is reduced potential for transmission of pathogens to other populations. In comparison, upriver programs are subjected to the high density impacts and stresses of collection for transport and/or diversion through multiple bypass systems which can trigger disease transmission. As a consequence, direct infection of natural fish by Eagle Creek fish is minimal.

Many of the disease concerns related to hatchery fish are based on old management styles that emphasized the release of large numbers of fish regardless of their health status. Since then, the desire to reduce disease has instigated better husbandry, including critical decreases in fish numbers to reduce crowding and stress that affects the resistance of

salmonids to disease (Salonius and Iwama 1993; Schreck et al. 1993). Along with decreased densities and improved animal husbandry, advances in fish health care and adherence to federal and interagency fish health policies have significantly decreased the possibility of disease transmission from hatchery fish to wild/native fish.

Eagle Creek NFH, like other federal hatcheries, has improved management techniques resulting in healthy coho and steelhead. Over the years, lowered rearing densities have significantly reduced disease. Other factors also contribute to the general good health of the Eagle Creek stocks. A natural barrier waterfall safeguards the hatchery water supply from straying anadromous fish and the hatchery is located on a creek that encourages well-timed (and locally-adapted) runs, both important towards preventing disease transmission. Additionally, during their migrations from and to the hatchery, the Eagle Creek stocks apparently avoid some of the interactions or environmental conditions that induce post-hatchery infections (Traxler et al 1997). This may be why the Eagle Creek adults have returned only twice with virus (infectious hematopoietic necrosis virus in steelhead only, 1988 and 1966) in the history of the hatchery. Careful disinfection of the eggs and the fact that no anadromous fish or infected native fish reside in the water supply serve to prevent infection of the susceptible juveniles. The Lower Columbia River Fish Health Center is located nearby so fish health sampling, diagnosis, and treatment are readily available as fish health issues arise.

As long as the Eagle Creek stocks remain healthy, there are few disease concerns to the wild/native fish. An important component to this are the USFWS Fish Health Policy and IHOT policies which prohibit the introduction of stocks from virus-positive adults into a station which is classified as virus-free. Thus, Eagle Creek NFH fish have never suffered the decimating and uncontrollable losses caused by virus and have therefore never posed a viral threat to wild/native fish. The policy requirements are especially appropriate to this facility where serial reuse of water makes it difficult to isolate stocks to prevent transmission of water-borne infections.

While fish managers largely understand the epidemiology of pathogens at each hatchery, the same cannot be said of wild fish. Recent studies suggest that the incidence of some pathogens in naturally spawning populations may be higher than in hatchery populations (Elliot and Pascho 1994). Indeed, *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease (BKD), appears, in general, to be significantly more prevalent among wild smolts of spring/summer chinook salmon than hatchery smolts (Congleton et al. 1995; Elliot et al. 1997). Many biologists believe disease-related losses in naturally spawning populations often go undetected, and that the impact of disease is underestimated (Goede 1986; Steward and Bjornn 1990). In addition, although pathogens may cause significant post-release mortality in fish from some hatcheries, there is little evidence that hatchery origin fish routinely infect naturally produced salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Foott et al. 2000; Steward and Bjornn 1990). Additional information on wild fish health has been collected since 1997 by the USFWS Fish Health Centers through the National Wild Fish Health Survey which is being conducted to better understand the health status of wild fish

and to address the issues of disease interactions (http://wildfishsurvey.fws.gov). Recently, wild fish samples have been taken from above and below the Eagle Creek NFH to examine their health status.

Eagle Creek NFH, as do all federal hatcheries in the Columbia River Basin, takes extensive measures to control disease and release healthy fish.

6. Competition- Salmon and steelhead smolts actively feed during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988). Competition could occur where food supplies are inadequate for migrating salmon and steelhead. However, the degree to which smolt performance and survival are affected by insufficient food supplies is unknown (Muir and Coley 1994).

The impacts from competition are assumed to be greatest in the spawning and nursery areas at points of highest density (release areas) and diminish as hatchery smolts disperse (USFWS 1994). Release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate from the release site. Eagle Creek NFH hatchery production is released into Eagle Creek at the hatchery site and it is assumed that they migrate quickly into the mainstem Clackamas and Columbia River migration corridor en route to the ocean. Because Eagle Creek NFH releases occur "low" in the Columbia Basin system relative to many other upriver programs, there is reduced opportunity for competitive interactions.

The size of the fish at release is also an important factor to consider. The target release size from the hatchery was determined through previous consultations with NMFS and ODFW. It was determined that hatchery steelhead released at 5 to 6 fish/lb., between 180mm and 250mm, would promote the most effective smolt that would migrate quickly downstream to the ocean. This release size was thought to minimize impact on resident fish and maximize survival of hatchery fish. Promoting fish growth to this size at release does however produce a hatchery fish larger than their wild counterpart. As previously stated in Section 2.2.2, the mean length of naturally produced steelhead smolts was 158mm and 156mm fork length (FL) in 1999 and 2000, respectively; whereas, the hatchery release goal is between 180mm and 250mm. McMichael et al. (1999) observed behavioral interactions between hatchery and wild steelhead in tributaries of the Yakima River, Washington where the larger hatchery steelhead appeared to be at a competitive advantage. Additional sampling such as snorkel surveys, juvenile out-migrant trapping, and radio telemetry would provide valuable information on behavior, the timing of emigration, and level of residualism of steelhead released from Eagle Creek NFH. The results of this information would help managers balance the need to maximize survival of hatchery fish, minimize the time hatchery fish spend in the stream, and minimize negative interactions between hatchery smolts with their wild cohorts.

7. Predation- Juvenile steelhead trout released from Eagle Creek NFH could potentially prey on naturally produced juvenile steelhead, coho, Chinook, rainbow or cutthroat trout fry in Eagle Creek and the lower Clackamas River. One study found that hatchery coho

salmon have the ability to consume fall Chinook salmon juveniles between 40% to 46% of the coho's body length (Pearsons and Fritts 1999). Pearsons and Fritts (1999) reported comparable size preferences for hatchery steelhead trout from other studies as well. Two factors should minimize this predation potential: 1) The primary spawning and rearing areas for natural trout and steelhead populations of Clackamas River are in the upper Clackamas River basin, reducing the potential for significant impacts to listed species, and 2) Release of hatchery smolts that are physiologically ready to migrate is expected to minimize predator-prey interactions in Eagle Creek and the lower Clackamas River, as they should quickly migrate from the release site to ocean rearing.

Depending on species and population, hatchery smolts are often released at a size that is greater than their naturally-produced counterparts, which is true for Eagle Creek NFH releases. In addition, for species that typically smolt at one year of age or older (e.g. steelhead, spring Chinook salmon), hatchery-origin smolts may displace younger year classes of naturally-produced fish from their territorial feeding areas. Both factors could lead to predation by hatchery fish on naturally produced fish, but these effects have not been extensively documented, nor are the effects consistent (Steward and Bjornn 1990). A primary concern is the potential impact of predation by residualized hatchery steelhead on naturally-spawning populations.

In general, the extent to which salmon and steelhead smolts of hatchery origin prey on fry from naturally reproducing populations is not known, particularly in the Columbia River basin. The available information - while limited - is consistent with the hypothesis that predation by hatchery-origin fish is, most likely, not a major source of mortality to naturally reproducing populations, at least in freshwater environments of the Columbia River basin (Enhancement Planning Team 1986). However, virtually no information exists regarding the potential for such interactions in the marine environment.

Releasing large numbers of hatchery fish may also lead to a shift in the density or behavior of non-salmonid predators, thus increasing predation on naturally reproducing populations. Conversely, large numbers of hatchery fish may mask or buffer the presence of naturally produced fish, thus providing sufficient distraction to allow natural juveniles to escape (Park 1993). Prey densities at which consumption rates are highest, such as northern pikeminnow in the tailraces of main stem dams (Beamesderfer et al. 1996; Isaak and Bjornn 1996), have the greatest potential for adversely affecting the viability of naturally reproducing populations, similar to the effects of mixed fisheries on hatchery and wild fish. However, hatchery fish may be substantially more susceptible to predation than naturally produced fish, particularly at the juvenile and smolt stages (Piggins and Mills 1985; Olla et al. 1993).

Predation by birds and marine mammals (e.g. seals and sea lions) may also be significant source of mortality to juvenile salmonid fishes, but functional relationships between the abundance of smolts and rates of predation have not been demonstrated. Nevertheless, shorebirds, marine fish, and marine mammals can be significant predators of hatchery fish immediately below dams and in estuaries (Bayer 1986; Ruggerone 1986; Beamish et

al. 1992; Park 1993). Unfortunately, the degree to which adding large numbers of hatchery smolts affects predation on naturally produced fish in the Columbia River estuary and marine environments is unknown, although many of the caveats associated with predation by northern pikeminnow in freshwater are true also for marine predators in saltwater.

As discussed above, Eagle Creek NFH releases may contribute to indirect predation effects on listed stocks by attracting predators (birds, fish, pinnipeds) and/or by providing a large forage base to sustain predator populations. On the other hand, a large mass of hatchery fish moving through an area may confuse or distract predators or have a "swamping" effect towards predators providing them prey that are more readily accessible than wild stocks thereby providing a beneficial effect to listed species. The presence of large numbers of hatchery fish may also alter the listed species behavioral patterns, which may influence vulnerability and prey susceptibility (USFWS 1994).

8. Residualism- Eagle Creek NFH hatchery production is volitionally released into Eagle Creek at the hatchery site and it is assumed that they migrate quickly into the main stem Clackamas and Columbia River migration corridor en route to the ocean. Most fish (>98%) leave the hatchery and enter Eagle Creek during the volitional release period. Those fish remaining at the end of the volitional release period are forced out (generally less than 2% of total production). Eagle Creek NFH releases are not known to residualize in Eagle Creek where they are released or in the Clackamas River, however, snorkel surveys, migrant traps, and radio telemetry projects would help to provide a definitive answer to hatchery out-migration questions. The target release size of 180mm to 250mm is met, per hatchery Biological Opinion (NMFS 1999a).

9. Migration corridor/ocean- The hatchery production ceiling called for in the Proposed Recovery Plan for Snake River Salmon of approximately 197.4 million fish (1994 release levels) has been incorporated by NMFS into their recent hatchery biological opinions to address potential main stem corridor and ocean effects as well as other potential ecological effects from hatchery fish. Although hatchery releases occur throughout the year, approximately 80 percent occur from April to June (NMFS 1999c) and Columbia River out-migration occurs primarily from April through August. Eagle Creek NFH production is typically released in April and May under a volitional release strategy. Volitionally released fish, with a propensity to migrate, should reduce potential migration corridor effects as the fish migrate quickly out of the system. The total number of hatchery fish released in the Columbia River basin has declined by about 26 percent since 1994 (NMFS 1999c) reducing potential ecological interactions throughout the basin.

Competition in the estuary. Juvenile salmon and steelhead, of both natural and hatchery origin, rear for varying lengths of time in the Columbia River estuary and pre-estuary before moving out to sea. The intensity and magnitude of competition in the area depends on location and duration of estuarine residence for the various species of fish. Research suggests, for some species, a negative correlation between size of fish and residence time in the estuary (Simenstad et al. 1982).

While competition may occur between natural and hatchery juvenile salmonids in - or immediately above - the Columbia River estuary, few studies have been conducted to evaluate the extent of this potential problem (Dawley et al. 1986). The general conclusion is that competition may occur between natural and hatchery salmonid juveniles in the Columbia River estuary, particularly in years when ocean productivity is low. Competition may affect survival and growth of juveniles and thus affect subsequent abundance of returning adults. However, these are postulated effects that have not been quantified or well documented.

Competition in the ocean. Ocean rearing conditions are dynamic. Consequently, fish culture programs might cause density-dependent effects during years of low ocean productivity, especially in near-shore areas affected by upwelling (Chapman and Witty 1993). To date, research has not demonstrated that hatchery and naturally produced salmonids compete directly in the ocean, or that the survival and return rates of naturally produced and hatchery origin fish are inversely related to the number of hatchery origin smolts entering the ocean (Enhancement Planning Team 1986). If competition occurs, it most likely occurs in near-shore areas when (a) upwelling is suppressed due to warm ocean temperatures and/or (b) when the abundance or concentration of smolts entering the ocean is relatively high. However, we are only beginning to understand the food-chain effects of cyclic, warm ocean conditions in the eastern north Pacific Ocean and associated impacts on salmon survival and productivity (Beamish 1995; Mantua et al. 1997). Consequently, the potential for competition effects in the ocean cannot be discounted (Emlen et al. 1990).

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Water rights for the Eagle Creek NFH total 110.02 cfs. This includes 0.02 cfs from one spring for incubating eggs for winter steelhead, two fish ladder passage ways at 27 cfs each located downstream of the hatchery in Eagle Creek, and 56 cfs for fish culture use derived from the hatchery intake structure located one quarter mile upstream of the hatchery in Eagle Creek. The water for raceway fish production is serial use. There are three upper banks of twelve raceways and three lower banks of thirteen raceways. During low creek flows water is serial used through all six banks of raceways. In 2001 the water line to the upper raceways was replaced with a larger size that increased the potential for 25% more water flow. Water use for production ranges from 5,785 gpm to 12,380 gpm. The hatchery monitors water discharges and is in compliance with the current NPDES permit.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Hatchery intake screens currently conform with NMFS screening guidelines. Additionally, no wild or hatchery anadromous fish are found upstream of the hatchery intake structure because the natural falls is a barrier to upstream migration.

SECTION 5. FACILITIES

5.1) Brood stock collection facilities (or methods).

Fish enter the hatchery volitionally via a fish ladder below an electric weir. Fish are trapped in the fish ladder after passing through a V-trap which is installed on one of the steps of the ladder.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Adult fish are manually netted in the fish ladder, placed in a 300 gallon fiberglass tank which is mounted on a pickup and transported to the adult holding channel where they are held for sorting.

5.3) Brood stock holding and spawning facilities.

Brood stock facilities include the collection pool in the fish ladder and a 10' x 120' x 3' holding channel. Adult fish are moved from the collection pool as described in **5.2**. A mechanical crowder moves the fish into a braille lift from which the fish slide into the carbon dioxide anesthetic tank. The fish are checked for ripeness with green fish being returned to the upper section of the holding channel. Ripe fish are killed using a guillotine and placed on aluminum racks.

5.4) Incubation facilities.

Egg incubation takes place in the nursery building using six (6) vertical 16-tray incubators with trout screens. Water flow is initially set at 3 gpm and increased to 4 gpm after hatching. Water use is primarily ambient Eagle Creek with limited spring water available for warmer incubation water to speed up egg development. The ambient water flows through a down-flow gravel bed prior to incubation or nursery tank use. Eggs are treated 5 times weekly with 1,667 ppm formalin for fifteen (15) minutes to control fungus. The formalin is dispensed using a delivery system ensuring proper dilution and timing.

5.5) Rearing facilities.

Rearing of winter steelhead begins inside the hatchery building in 3' x 16' x 3' fiberglass nursery tanks with a 30 gpm flow of filtered Eagle Creek water. When the steelhead attain a size of 250-300 fish/lb, they are moved to the outside 8' x 80' x 2' raceways for rearing. The fish are held in the raceways until late March when the pond screens are removed allowing the fish to volitionally migrate downstream.

5.6) Acclimation/release facilities.

The fish are volitionally released from their production raceways into Eagle Creek as described in **5.5**.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

There have been no significant fish mortalities from operational difficulties or disasters.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

The hatchery has low water alarm probes positioned in three strategic locations to prevent fish losses due to water flow failures. The alarm system is linked with a 24hr./ 7day security operator. Operators telephone hatchery staff and identify the trouble zone. Also the alarm sounds on station to alert staff.

Fish health and disease prevention is managed in accordance with the U.S. Fish and Wildlife Service's Fish Health Policy, the "Policy and Procedures for Columbia Basin Anadromous Salmonid Hatcheries" (IHOT 1995), and protocols of Oregon. Any health problems are managed promptly by fish health personnel to limit mortality and reduce disease transmission. The Eagle Creek steelhead juveniles and adults remain free of the regulated pathogens (viruses and *Myxobolis cerebralis*). No offspring from virus-positive brood stock are allowed on station.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Returns to the hatchery are used for hatchery production of winter steelhead. If numbers of returning brood stock were insufficient to meet the hatchery production goals, production was met using Clackamas River stock.

6.2) Supporting information.

6.2.1) History.

"The stock of winter steelhead used at ECNFH is a combination of Big Creek and native Clackamas winter steelhead stocks. Current practice is to use only those adults returning to the hatchery." (ODFW 1992).

6.2.2) Annual size.

Brood stock goal is 500 adults, averaging 50% female. Actual brood stock used for the hatchery program has ranged from 237 to 1,261 adults since 1980.

6.2.3) Past and proposed level of natural fish in broodstock.

There are no wild fish currently used for Eagle Creek NFH production.

Late winter steelhead collected at ODFW or PGE facilities were used to initiate the transition to the native stock program per 1999 Biological Opinion, RPA1.e.1. In 1999 and 2000 the hatchery initiated pilot production of native late winter steelhead from 80,000 and 96,000 eggs received from ODFW, respectively. At a hatchery coordination meeting in February of 2001, ODFW requested to curtail future production of late stock winter steelhead at Eagle Creek NFH and continue development of a Clackamas River wild winter steelhead program at their facilities. After discussion of the current problems at Eagle Creek for early incubation chilling of late winter steelhead, the limited availability of native brood stock, funding issues, and the desire to maintain the early run component for sport fisheries, the co-managers (ODFW, NMFS, and USFWS) agreed to stop production of native, late winter steelhead at Eagle Creek NFH.

6.2.4) Genetic or ecological differences.

The hatchery stock at Eagle Creek has both Big Creek (early-run) and indigenous stock phenotypic, genotypic, and behavioral traits (see brood stock history). The wild indigenous stock is considered late-run.

There are wild, late-run winter steelhead returning to lower Eagle Creek, believed to be primarily produced in the North Fork of Eagle Creek. Additional sampling through underwater video and radio telemetry from the lower ladder in Eagle Creek as well as reproductive success and genetics studies would shed more light on the behavior and origin of hatchery and wild steelhead in Eagle Creek. This additional information would be helpful for protecting wild, listed fish, assessing risk (Pearsons and Hopley 1999) and provide information for future brood stock management decisions. Refer to Section 3.5 of this document for further discussion on this topic.

6.2.5) Reasons for choosing.

Available brood stock from nearby watersheds, run timing, and harvest contribution.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of brood stock selection practices.

No listed fish are currently used for Eagle Creek NFH production.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adult brood stock returning to the hatchery.

7.2) Collection or sampling design.

Steelhead hatchery production from Eagle Creek NFH are uniquely marked and only those marked fish from the hatchery are used for brood stock. Brood stock are collected at the hatchery ladder and holding pond. These fish return to the hatchery from mid November to April and are spawned from December to mid-March. Eagle Creek brood stock are randomly selected and spawned at a 2:2 male to female ratio. When excess steelhead eggs are taken, a portion of eggs from each female is kept for on-station rearing. The remaining eggs are either destroyed or transferred for use in other programs where acceptable. Fish are randomly spawned throughout run.

7.3) Identity.

All hatchery releases from Eagle Creek are externally marked with a unique fin clip, currently adipose and right ventral fins are clipped.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

1. Collect Adults Throughout Run
2. Spawning Pop. of 500 adults
3. Spawning Ratio 2:2 , Male:Female ratio

7.4.2) Brood stock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Year	Adults Spawned Females	Males	Jacks	Eggs	Juveniles
1988	149	149			
1989	213	188			
1990	152	150			
1991	207	167			
1992	324	335			
1993	488	345			
1994	125	117			
1995	401	475			
1996	115	122			
1997	308	327			
1998	307	258			
1999	389	441			
2000	171	171			
2001	252	263			

Data source: USFWS Columbia River information System (CRiS), Vancouver, WA

7.5) Disposition of hatchery-origin fish collected in surplus of brood stock needs.

If more fish return to the hatchery than are needed for brood stock, excess fish are randomly selected and removed throughout the run. Refer to Section 7.8 for disposition of carcasses.

7.6) Fish transportation and holding methods.

Adult returning fish enter adult holding pond on own volition and are utilized for spawning throughout run as needed.

7.7) Describe fish health maintenance and sanitation procedures applied.

Personnel from the Lower Columbia River Fish Health Center test for the listed pathogens as defined by USFWS Fish Health Policy and Implementation Guidelines (infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum*

(BKD), *Aeromonas salmonicida, and Yersinia ruckeri*, and *Myxobolis cerebralis*) and for *Ceratomyxa shasta* and erythrocytic inclusion body syndrome. Samples are taken from 150 female and 60 male adults throughout the spawning period to ascertain the health profile. As defined by the USFWS Fish Health Policy, Eagle Creek NFH is classified as a virus-free facility so adult fish from facilities with a history of virus are not allowed on station.

7.8) Disposition of carcasses.

Carcasses have been utilized by the Warm Springs and Yakama Indian Reservations. If available, fish are also distributed to suppliers for federal prisons. Carcasses not utilized or rendered are buried.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the brood stock collection program.

Refer to Section 3.5 of this document, specifically "Brood Stock Collection" discussion.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Fish are spawned randomly over entire run, from ripe fish on selected days over a 3 to 4 week period.

8.2) Males.

If short of males, the hatchery will use males more than once as needed.

8.3) Fertilization.

2:2 individual matings, 1% saline solution used to enhance fertilization, ovarian fluid is drained.

8.4) Cryopreserved gametes.

Cryopreservation is not used at Eagle Creek NFH.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Not Applicable.

SECTION 9. INCUBATION AND REARING –

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Brood Year		Eggs Taken	Eyed	On-Feed[1]	Released[2]
92	#	1,119,573	1,057,043	358,407	187,654
	%		94	84	
93	#	2,287,269	2,023,158	441,086	175,669
	%		95	71	
94	#	574,547	515,960	325,117	178,199
	%		90	87	
95	#	1,443,214	1,272,801	1,250,839	175,765
	%		88	87	
96	#	450,913	417,530	411,605	206,735
	%		93	91	
97	#	1,233,044	1,178,944	342,449	206,051
	%		96	85	
98	#	1,346,569	1,285,415	329,132	204,931
	%		96	83	
99	#	1,592,107	1,516,965	305,397	205,447
	%		95	79	
00	#	789,864	772,040	189,512	112,717
	%		98	91	

9.1.2) Cause for, and disposition of surplus egg takes.

Extra eggs may be taken to safeguard against potential incubation losses.

9.1.3) Loading densities applied during incubation.

Fertilized eggs from four females (12,000 - 20,000 eggs) are placed into each incubation tray. At eye-up, after shocking and picking, live eyed-eggs are randomly selected from each tray to maximize a genetic cross-section of the entire

[1] Accounts for number of eggs and unfed fry discarded, shipped, and mortality (from CRiS Egg Summary report). Percent survival is cumulative from eggs taken to # on-feed.

[2] The number transferred in and out will need to be accounted for before calculating survival from # on-feed to # released (from CRiS SR80s distribution report), but is generally about 93% (IHOT 1996).

run. Eyed eggs are enumerated at 9,000 per tray for a total of twenty (20) trays. The initial water flow per incubator stack is set at 3 gpm and is increased to 4 gpm after hatching is complete.

9.1.4) Incubation conditions.

Temperatures during incubation range from 34 to 50 degrees F. Dissolved oxygen is not regularly monitored, but has been tested and found to be at saturation. Ambient Eagle Creek water is filtered through a down-flow gravel bed to remove sedimentation. A limited supply of spring water with a winter temperature range of 44 to 52 degrees, dependent upon ambient temperatures, is utilized for incubation to close the development gap between the January and March spawn.

9.1.5) Ponding.

Swim-up fry are transferred from the incubation trays into inside fiberglass 3' x 16' x 3' hatchery nursery tanks. Two (2) trays are placed into each tank (10 tanks total) for a total of approximately 18,000 fry per tank(180,000 feeding fry). When the fish attain a size of 250-300 fish per pound, they are transferred to the outside raceways (two tanks per raceway). When the fish are mass marked during the summer or early fall, the raceway inventory is established at 16,000 fish per raceway. The fish remain at this population size throughout the winter and early spring months awaiting volitional release which begins in late March.

9.1.6) Fish health maintenance and monitoring.

Minimal health concerns exist for progeny originating from Eagle Creek brood stock which are free from virus and have minimal incidence of vertically-transmitted pathogens. However, eggs received from other stations must be from adults individually tested and certified free of virus. The eggs are to be water-hardened in 50 ppm iodine for 30 minutes at the spawning site prior to transport to Eagle Creek NFH. Upon receipt, eggs received at Eagle Creek are disinfected with iodine to prevent virus transfer.

The first health exam of newly hatched fish occurs when approximately 50% are beyond the yolk sac stage and begin feeding. Sixty fish are sampled and tested for virus. Regular fish health checks are done on a monthly basis by the fish health specialist from the Lower Columbia River Fish Health.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

None affected

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

See Table in Section 9.1.1 of this report.

9.2.2) Density and loading criteria (goals and actual levels).

Current production goals are to have a final density index of below 0.54 and a flow index of no higher than 1.5 (Piper et al., 1982, Banks et al 1992). Maximum density and loading criteria are for maximum loadings of 8 lbs/gpm or 3.25 lbs/cu. ft.

9.2.3) Fish rearing conditions

Temperature readings are taken using thermograph probes which take readings continuously. Temperatures in the raceways range from 32 ^{o} F to 65 ^{o} F for the containment of winter steelhead trout. Mortalities are removed daily, recorded, and deducted from raceway inventory. Raceways are cleaned with a broom while effluent water is drained to a pollution abatement pond. Cleaning is performed as needed but no less than once a week. Dissolved oxygen, carbon dioxide and total gas pressure have not been regularly monitored, is not considered a problem, and is measured periodically, as necessary. Fish are reared on creek gravity flow water.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

End of Month Growth Parameters for Eagle Creek NFH Winter Steelhead, Brood Year 2000.

Month	Total Length (inches)	#/lb	Conversion	Density Index	Flow Index
April	1.20	1666	0.14	0.40	
May	1.85	449	0.66	0.27	0.75
June	2.57	168	0.98	0.08	0.20
July	3.37	75		0.10	0.28
Aug.	4.41	33	1.68	0.11	0.29
Sept.	5.29	19	1.38	0.15	0.42
Oct.	5.70	15	3.86	0.18	0.49
Nov.	6.60	10	0.39	0.24	0.65
Dec.	6.60	10		0.24	0.65
Jan.	7.22	7.6	0.92	0.29	0.78
Feb.	7.22	7.6		0.29	0.78
Mar.	7.61	6.5	1.10	0.32	0.87
April	7.91	5.8	1.31	0.33	0.91

Fish were volitionally released by May 15th.
Data extrapolated from Lot History Production, CRiS 12/05/02.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Energy reserve information is not available. Refer to Section 9.2.4 for growth data.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Steelhead fry are placed in fiberglass tanks and initially fed Bio Oregon's Starter Diet #1 and #2 by hand. When they begin actively feeding, they are fed Bio Starter #3, Bio Dry 1000 1.0 mm and 1.3 mm pellets via overhead automatic feeders. When they attain a size of 250-300 fish per pound, the fish are moved to outside raceways where they are fed Bio Dry 1000 1.3 mm, Bio Dry 500 1.5 mm and 2.0 mm by hand until early September. During the summer months, the fish are also fed during the evening hours to maximize growth. In early September, the fish are fed Bio Dry 500 in 2.5 mm, 3.0 mm and 4.0 mm pellet utilizing demand feeders (two per raceway) until volitional release the following April.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
The Lower Columbia River Fish Health Center (LCRFHC) in Underwood, WA provides fish health care for the Eagle Creek NFH as described in the USFWS Fish Health Policy and Implementation, 713 FW and the 1995 IHOT report "Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries" as approved by state, federal, and tribal agencies. A fish health specialist visits at least once per month to examine fish in each lot, checking both healthy and symptomatic fish in the rearing ponds. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes an external and internal examination of skin, gills, and internal organs. Kidneys (and other tissues, if necessary) are checked for the common bacterial pathogens by culture and by a specific test for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other infections. Additional tests for virus or parasites are done if warranted. As needed, appropriate remedial or chemotherapeutant treatments will be prescribed to control or prevent disease outbreaks.

All juveniles originating from other stations must be checked for pathogens and certified free of virus prior to transfer to Eagle Creek. Fish from a station with a history of virus are not allowed into Eagle Creek NFH unless the stock is considered threatened/endangered and comes from adults that were individually tested and certified free of virus.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Not measured.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

None applied other than volitional release ponds.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

No ESA fish reared at hatchery.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

Winter steelhead yearlings are volitionally released on-station April and May at approximately 5 to 6 fish/lb. Those remaining at the end of the volitional release period are forced out (generally less than 2% of total production).

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	150,000 on-station	5 to 6 fpp	April – May	Eagle Creek

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: On-Station Release into Eagle Creek
Release point: Eagle Creek, Rkm 16, 46°16'34" N Lat. And 122°12'04" W Long.
Major watershed: Clackamas, Oregon
Basin or Region: Lower Willamette and Columbia Rivers

10.3) Actual numbers and sizes of fish released by age class through the program.

Eagle Creek NFH winter steelhead releases in Eagle Creek.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1990							169,000	6/lb.
1991							167,000	7/lb.
1992							151,000	7/lb.
1993							188,000	7/lb.
1994							176,000	6/lb.
1995							178,000	5/lb.
1996							176,000	5/lb.
1997							207,000	5/lb.
1998							206,000	5/lb.
1999							205,000	6/lb.
2000							205,000	6/lb
2001							113,000	6/lb.
2002							142,000	8/lb.
Average							176,000	6/lb.

Data source: USFWS Columbia River information System (CRiS), Vancouver, WA 09/19/02

10.4) Actual dates of release and description of release protocols.

Winter steelhead smolts are volitionally released from the hatchery into Eagle Creek, April through May, at approximately 5 to 6 fish/lb. Those remaining at the end of the volitional release period are forced out (generally less than 2% of total production).

10.5) Fish transportation procedures, if applicable.

Other agencies are responsible for moving fish off station.

10.6) Acclimation procedures (*methods applied and length of time*).

Winter steelhead smolts are volitionally released from the hatchery into Eagle Creek, April through May, at approximately 5 to 6 fish/lb.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All winter steelhead released into Eagle Creek are 100% marked with an adipose and right ventral fin clip.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Pending discussion with co-managers through U.S. v Oregon forums, fish are either destroyed, transferred, or released on-station.

10.9) Fish health certification procedures applied pre-release.

Hatchery operations comply with the USFWS Fish Health Policy and Implementation Guidelines and the Integrated Hatchery Operations Team's Fish Health Policy. Three to six weeks prior to release, 60 fish from each lot are given a health exam. This includes a testing of the most susceptible species (steelhead) for *Myxobolis cerebralis*, causative agent of whirling disease. If fish are held longer than one month from the designated release date a second health exam is performed.

Only Eagle Creek stocks are released into Eagle Creek. All stocks originating from off-station are transferred for release elsewhere to prevent vertically-transmitted disease introductions.

10.10) Emergency release procedures in response to flooding or water system failure.

Fish are released on-station in case of emergency. If time permits, other agencies will be contacted for temporary holding facilities.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

The hatchery strives to produce functional smolts which survive and quickly migrate to the ocean. From the analysis presented in Section 3.5 of this document, hatchery operations will not adversely affect listed species in the watershed. However, additional studies on the behavior of hatchery and wild steelhead in Eagle Creek would be helpful for assessing risk (Pearsons and Hopley 1999) and provide information for future production management decisions. For a detailed discussion of potential genetic and ecological interactions, please see Section 3.5 of this report.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Refer to Section 1.10 of this document for a discussion of how each "Performance Indicator" will be monitored and evaluated.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Funding and staffing is available to complete most of the monitoring and evaluation items identified in Section 1.10 of this document (see also Section 12: Research).

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring and evaluation activities will not affect listed species.

SECTION 12. RESEARCH

Research is not currently being conducted at Eagle Creek NFH. While the Service has determined that hatchery operations will not adversely affect listed species, additional research at the hatchery and in the stream before and after release would shed more light on this topic. Potential projects include observing juvenile and adult fish behavior, documenting ecological interactions, assessing ecological and genetic risks, and determining reproductive success of hatchery and native fish in the stream. Sampling techniques may include snorkeling, underwater video, trapping, spawning surveys, genetic typing, and radio telemetry. This additional hatchery assessment work has been submitted through the USFWS Fisheries Operation Needs (FONS) Fisheries Information System (FIS) but is currently un-funded. The four projects submitted under FONS for Eagle Creek NFH assessment are: 1) Ecology of hatchery and wild fish in Eagle Creek, FONS Project # 2000-001, 2) Video monitoring adult passage of wild and hatchery fish at the lower ladder in Eagle Creek, FONS Project # 2002-008, 3) Evaluation of simulated natural rearing (NATURES) at Eagle Creek NFH, Project # 2002-009, 4) Effect of raceway rearing density on winter steelhead survival at Eagle Creek NFH, FONS Project # 1999-009. If resources become available for any of these projects, the USFWS will re-initiate consultation before implementing, as appropriate.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _steelhead trout____ ESU/Population: Lower Columbia River _____ Activity: Brood stock Collection for early-run winter steelhead trout_				
Location of hatchery activity: Eagle Creek NFH ladder_____ Dates of activity:_September – November **Hatchery program operator:_U.S. Fish and Wildlife Service_____**				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			< 2	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Table 1 continued. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _late-run coho salmon____ ESU/Population: Clackamas River, State of Oregon listed population (not federally listed)_____ Activity: Brood stock Collection for early-run winter steelhead trout_				
Location of hatchery activity: Eagle Creek NFH ladder_____ Dates of activity:_September – November **Hatchery program operator:_U.S. Fish and Wildlife Service_____**				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. brood stock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			< 2	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as brood stock.
f. Intentional mortality of listed fish, usually as a result of spawning as brood stock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

- 1999 Biological Opinion on hatcheries in the Columbia River (NMFS 1999).

- 2000 Biological Opinions on the Federal Columbia River Power System (NMFS 2000 and USFWS 2000).

- ESA Informal Consultation and EFH Consultation regarding the Eagle Creek fish barrier replacement project at the Eagle Creek National Fish Hatchery, Clackamas County, Oregon (USFWS tracking number I/NWR/2002/00771).

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Bull Trout *(Salvelinus confluentus*, Threatened species*)*

Bull trout are listed as a threatened species in the Columbia River basin (Final Rule 50 CR Part 17, RIN 1018-AB94, June 10, 1998). Bull trout (Dolly Varden) were historically documented in the upper Clackamas River and tributaries. Status in the Clackamas River is listed as "probably extinct" (ODFW 1997).

Cutthroat Trout (*Oncorhynchus clarki*, not federally listed)

Cutthroat trout in the lower Columbia River were reviewed for listing by the USFWS in July 2002 but determined as not warranted for listing under the Endangered Species Act. From ODFW (1992): "At least three different life history strategies for cutthroat are thought to occur in the Clackamas Subbasin: 1) "anadromous" searun cutthroat, 2) freshwater migratory, or "potamodromous" cutthroat, and 3) "resident" cutthroat with little or no migration. Searun cutthroat are listed as Sensitive in Oregon. Very little is known about the status of migratory cutthroat in the Clackamas Subbasin." Additional information on cutthroat trout can be found in USFWS (2002).

Bald Eagle (*Haliaeetus leucocephalus*, Threatened Species – Delisting Proposed) [1]

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

Status: Bald Eagles were listed as endangered in the conterminous United States under the ESA on March 6, 1967 (32 FR 4001). The population in the Pacific Northwest was later downlisted on February 14, 1978 to threatened. Eagles in the remaining states were subsequently downlisted to threatened on July 12, 1995 (60 FR 36000). Bald eagle populations have rebounded considerably within the last few years, with nearly all recovery goals met for Oregon, Washington, and other regions of the country. On July 6, 1999 the USFWS proposed delisting bald eagles from the ESA. Bald eagles and golden eagles are, and will continue to, be protected under the Bald Eagle and Golden Eagle Protection Act of 1940 (as amended) and the Migratory Bird Treaty.

The northern bald eagle is closely associated with freshwater, estuarine, and marine ecosystems that provide abundant prey and suitable habitat for nesting and communal roosting (Watson et al. 1991). Breeding territories are typically located within one mile of permanent water in predominantly coniferous, uneven-aged stands with old-growth structural components (Anthony et al. 1982, Stalmaster 1987, Anthony and Isaac 1989). Bald eagles winter along ice-free lakes, streams, and rivers where food and perch sites are abundant and the level of human disturbance is low (USFS 1977, Steenhof 1978, Stalmaster 1980). Communal nights roosts are used by bald eagles primarily during the winter months. In the Pacific Northwest, communal roosts generally occur in multi-layered mature or old-growth conifer stands that provide protection from weather and human disturbance (Stalmaster and Newman 1979).

Home range size varies greatly according to food abundance and the availability of suitable nest and perch trees (Stalmaster 1987). Favored nest trees are usually the largest tree or snag in a stand that provides an unobstructed view of the surrounding area and a clear flight to and from the nest (Stalmaster 1987). Nest are usually built on limbs just below the crown, with the canopy above providing cover (USFS 1977). Nesting behaviors typically begin in January, followed by egg laying and incubation in February and March (Isaac et al. 1983). Young are reared throughout April, May, and June. Fledging occurs in July and August. Bald eagles are primarily predators but also opportunistic scavengers that feed on a variety of prey including salmon, other fish, small mammals, waterfowl, seabirds, and carrion (Snow 1981). Bald eagles usually forage in large open areas with a wide visual field and suitable perch trees near the food source (USFS 1985).

The bald eagle occurs throughout the United States and Canada. It winters primarily along rivers south of the Canadian border. The historic decline of the bald eagle has been attributed to the loss of feeding and nesting habitat, organochloride pesticide residues, shooting, poisoning, and electrocution (Snow 1981, USFWS 1986). Human interference has been shown to adversely affect the distribution and behavior of wintering bald eagles (Stalmaster and Newman 1978).

Critical Habitat: Critical habitat for bald eagles has not been formally designated by USFWS.

Use Of The Action Area: Bald eagles are not known to nest in lower Eagle Creek but occasionally forage in the lower watershed during the winter months (USFS 1995). The closest known bald eagle nest site is located approximately 11 miles northwest of ECNFH along lower Goose Creek (Issacs et al. 2001).

Northern Spotted Owl (*Strix occidentalis caurina*, Threatened Species) [1]

Status: The northern spotted owl was listed as a threatened species throughout its entire range in June 1990 (55 FR 26114). It ranges from southern British Columbia south to Marion County, California and east to the shrub steppe of the Great Basin in Oregon and California. In the Western Cascades, the northern spotted owl can be found from approximately sea level to 4000 feet in elevation (USFWS 1992).

Most observations of spotted owl habitat use have been made in forests with a component of old-growth and mature forests consisting of western hemlock, Douglas-fir and western red cedar. However, the northern spotted owl has been observed to use a wide variety of habitat types and forest stand conditions, including managed stands, for nesting, feeding or roosting (USFWS 1992). In general, northern spotted owls preferentially use forests with greater complexity and structure. In the Western cascades, the home range of northern spotted owl pairs ranges in size from approximately 1,450 acres to 9,750 acres with a median home range size of 2,950 acres (USFWS 1992).

Spotted owls do not build their own nests. They depend on suitable naturally occurring nest sites such as broken-top trees and cavities in older-age forests, abandoned raptor nests, squirrels nests and debris accumulations. Most northern spotted owl nest sites observed on public lands have been located in old-growth or mature forests (USFWS 1992). However, spotted owls are known to nest in managed stands, especially if residual old-growth characteristics are present. Owlets remain in the nest for three to five weeks and generally leave the nest before they can fly. They usually remain near the nest in nearby branches or on the ground where they are fed and tendered by both adults before dispersing in early fall (late September to early October) (USFWS 1992).

Roosting habitat are typically areas of relatively dense vegetation (high canopy closure dominated by large-diameter trees). Spotted owls respond to variations in temperature and move within the canopy to find favorable microclimate conditions which are facilitated by multistoried stand structure of roost sites (USFWS 1992).

Spotted owl foraging habitat is more varied but is generally characterized by high canopy closure and complex structure. Spotted owls are primarily nocturnal and eat small mammals, birds and insects. Both the woodrat (*Neotoma fuscipes and N. cinerea*) and the northern flying squirrel (*Glaucomys sabrinus*) compose the majority of the prey base of the spotted owl (USFWS 1992).

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

Critical Habitat: Critical habitat is designated for the northern spotted owl solely on 6.9 million acres of federal lands (57 FR 1796). Areas managed by the U.S. Forest Service (USFS) in upper Eagle Creek watershed are part of the critical habitat designation for northern spotted owl.

Use Of The Action Area: The USFS conducted spotted owl surveys between 1991 and 1993 in upper Eagle Creek watershed. Due to the sensitivity of spotted owl data, the USFS does not provide exact locations of spotted owl nest sites. However, there are no sites known to occur within the action area for the Fish Barrier Replacement Project, although individual spotted owls may occasionally pass through the area while foraging. There are four known spotted owl nesting sites within the upper Eagle Creek watershed and three additional sites just outside of the watershed. All of the spotted owl sites are within the Salmon-Huckleberry Wilderness Area or the Late-Successional Reserve (LSR), managed by USFS, immediately adjacent to the wilderness area. There are approximately 4720 acres of suitable nesting, roosting, and foraging habitat in the Eagle Creek watershed, primarily within the wilderness area and LSR (USFS 1995).

Willamette Daisy (*Erigeron decumbens*, Endangered Species) [1]

Status: The Willamette daisy is a member of the sunflower family (Asteraceae). This is another species that was originally found on native prairie habitat in the Willamette Valley and has been found in Benton, Clackamas, Lane, Linn, Marion, Polk, Washington, and Yamhill Counties.

Use of the Action Area: This species has not been reported at the project site and is not likely to occur. Currently no habitat exists at the project site for this species.

Bradshaw's Lomatium (*Lomatium bradshawii*, Endangered Species) [1]

Status: Bradshaw's lomatuim is a member of the Apiacea family, and also is known as Bradshaw's desert parsley. This species is endemic to wet, native prairies of the Willamette and Umpqua Valleys, and was once locally abundant. Habitat loss and degradation have led to this species' extirpation from most of its range. Bradshaw's lomatium is a perennial herb that grows from 8 to 20 inches tall, with finely divided basal leaves and small yellow flowers, subtended by green bracts divided characteristically by three (Eastman 1990, Guard 1995).

Use of the Action Area: There are no records of Bradshaw's lomatium occurring at the project site. In addition, pockets of wet, native grassland habitat do not occur at the project site.

Golden Indian Paintbrush (*Castilleja levisecta*, Threatened Species) [1]

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

Status: Golden Indian paintbrush is a member of *Scrophulariacea* family. This species is presumed extirpated and it has not been seen in Oregon for over 40 years. Golden Indian paintbrush was once found in the Willamette Valley in wet prairie areas with gravelly soils but without standing water, and was associated with wet prairie species such as tufted hairgrass *(Deschampsia caepitosa)* and camas *(Camassia)*.

Use of the Action Area: This species has not been reported to occur at the project site. The project site does not contain habitat that could support golden Indian Paintbrush.

Howellia (*Howellia aquatilis*, Threatened Species) [1]

Status: Howellia is a member of the bellflower family (*Campanulaceae*). This species historically occurred over a large area of the Pacific Northwest. Howellia is a hydrophytic annual plant that grows 4 to 24 inches in height, and has extensively branched stems with both submerged and emergent flowers. Low genetic variability of howellia limits the species to a highly specific habitat (USFWS 1994). Currently, howellia is known to exist in Washington, Montana, and Idaho but has been extirpated from California, Oregon and some sites in Washington and Idaho.

Use of the Action Area: There are no records of water howellia occurring at the project site. The project site does not contain habitat that could support water howellia.

Kincaid's Lupine (*Lupinus sulphureus* var. *kincaidii*, Threatened Species) [1]

Status: Kincaid's lupine is a member of the pea family *(Fabaceae)*. This species historically occurred west of the Cascade Mountains from Douglas County, Oregon to Lewis County, Washington. Kincaid's lupine is a perennial plant that grows 16 to 32 inches in height, and is associated with native upland prairie and open oak woodlands that have a history of fire disturbance. Currently, Kincaid's lupine is known to exist in 48 sites in the Willamette Valley, four sites in Douglas County, Oregon and two sites in Lewis County, Washington (USFWS 2000).

Use of the Action Area: This species is restricted to mesic to slightly xeric soils in native upland prairies, and is often found in association with fire resistant Oregon white oak (*Quercus garryana)*. There are no records of Kincaid's lupine occurring at the project site. The project site does not contain habitat that could support Kincaid's lupine.

Nelson's Checker-Mallow (*Sidalcea nelsoniana*, Threatened Species) [1]

Status: Nelson's checker-mallow is a member of the mallow family (*Malvaceae)*. This species historically occurred in western Oregon and Washington between southern Benton County, Oregon and Lewis County, Washington. Nelson's checker-mallow is a perennial herb that grows 16 to 40 inches in height, and is associated with streams,

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

meadows, swales and other open areas. Currently, Nelson's checker-mallow is known to exist at 48 sites in seven counties in Oregon and two sites in Lewis County, Washington (WNHP 1997, USFWS 1993).

Use of the Action Area: There are no records of Nelson's checker-mallow occurring at the proposed project site. The Project site does not contain any wet, native prairie habitat that could support Nelson's checker-mallow.

15.3) Analyze effects.

Identify potential direct, indirect, and cumulative effects of hatchery program on species and habitat (immediate and future effects, including duration and area of effects). Please focus analysis on the impact of hatchery program on listed/proposed species reproduction, numbers, and distribution.
Identify potential level of take (past and projected future).

No take of USFWS trust species will occur or be adversely affected by operation of Eagle Creek National Fish Hatchery. However, wild cutthroat and rainbow trout (not Federally listed) are occasionally observed at the hatchery during brood stock collection of coho and winter steelhead.

Bald eagles occasionally forage in the lower watershed during the winter months (USFS 1995). Adult hatchery fish in Eagle Creek could potentially serve as a forage base for bald eagles. Adult hatchery carcasses in Eagle Creek can also enhance nutrients and ecosystem productivity of the stream (Cederholm et al. 1999).

15.4) Actions taken to minimize potential effects.

No actions are necessary to address effects for USFWS ESA trust species. However, Eagle Creek has been identified as a stream for wild trout management (ODFW 1992). Natural production of cutthroat and rainbow trout (not Federally listed) is reported to occur in Eagle Creek, above and below the impassable falls at the hatchery. Unmarked "wild" trout which come into the hatchery during brood stock collection of coho and winter steelhead will be temporarily placed in a holding pond then returned to the creek per discussions with the ODFW District Biologist, Jim Muck, (503)657-2000.

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